OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **BEARCAMP POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a, also a measure of algal abundance, in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend with results below the NH mean reference line once again. The higher value in July was probably influenced by an abundance of golden-brown algae. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *worsening* trend in lake transparency, although transparency has rebounded from the all-time low in 1998. There has been an increase in water clarity again this year, and the transparency of the pond was highest in September when the chlorophyll-a concentrations were low. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stabilizing* trend for epilimnetic phosphorus levels, but show a *worsening* trend for the hypolimnion. The phosphorus concentrations in the hypolimnion were extremely high in July and August this year. This was due to a large amount of sediment from the pond bottom in the samples, which can cause inaccurate results. The September result is a more accurate account of the actual phosphorus concentrations of the hypolimnion. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- As stated in the Figure Interpretation section above, the hypolimnion phosphorus was elevated in July and August due to sediment in the sample. This is evident when looking at the turbidity values for the hypolimnion (Table 11). The July sample may have been influenced by winds, also. When sampling the bottom layer please make sure there is no sediment apparent in the bottle. To reduce the chances of getting sediment in the sample try sampling on the opposite end of the boat from the anchor, which stirs up bottom sediment.

- Conductivity appears to be increasing over the years in the epilimnion (Table 6). Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. It would be useful to uncover the reasons for increased conductivity as we continue to monitor the lake.

- The mean pH of the epilimnion was much lower this year than last year (Table 4). The pH was 4.09 on August 2nd. The acid neutralizing capacity (ANC) was also low on this date (see Chemistry Raw Data Report). We are unsure what caused the lesser values, although it is likely that it was a result of a sampling error. We will watch for this result to return in the coming years.

- The Inlet had higher total phosphorus levels than usual in July (Table 8). The concentration of that sample is considered high for New Hampshire's waters. The concentrations returned to their normal levels in August and September. The PreInlet was also a little higher than normal in July. It is possible the July samples were taken in shallow areas or after a rainstorm. We will watch for the high levels to return in the future and hopefully we will be able to pinpoint whether there is an external source of nutrients entering the Inlet by sampling the Inlet at several stations.

NOTES

- Monitor's Note (7/7/00): 2 Adult loons seen.
- Biologist's Note (8/2/00): Hypolimnion was sampled in the sediment. Could explain high phosphorus and turbidity.
- Monitor's Note (9/7/00): 2 Loons seen. Collected suspected milfoil samples.

USEFUL RESOURCES

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Septic Systems and Your Lake's Water Quality, *WD-BB-11*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

Handle With Care: Your Guide to Preventing Water Pollution. Terrene Institute, 1991. (703) 661-1582.

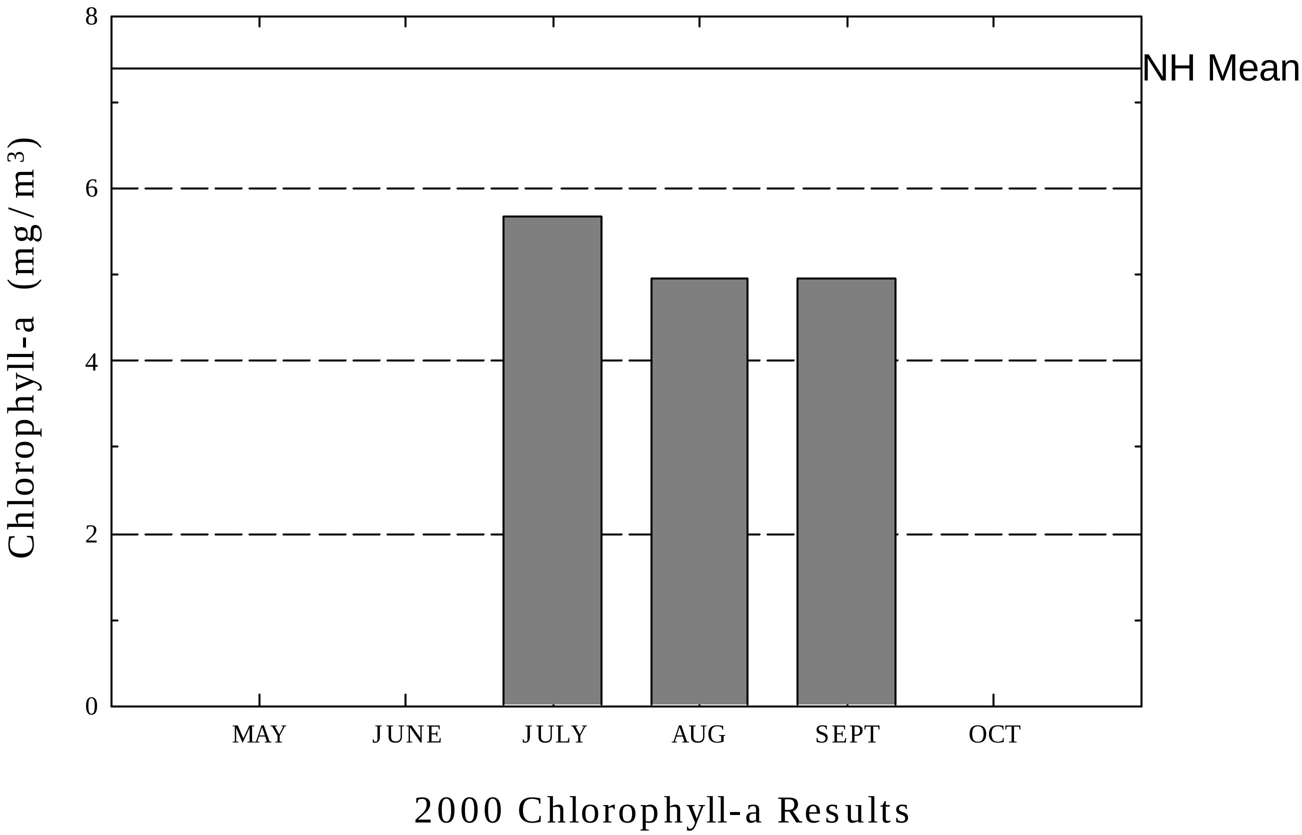
Aquatic Plants and Their Role in Lake Ecology, WD-BB-44, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

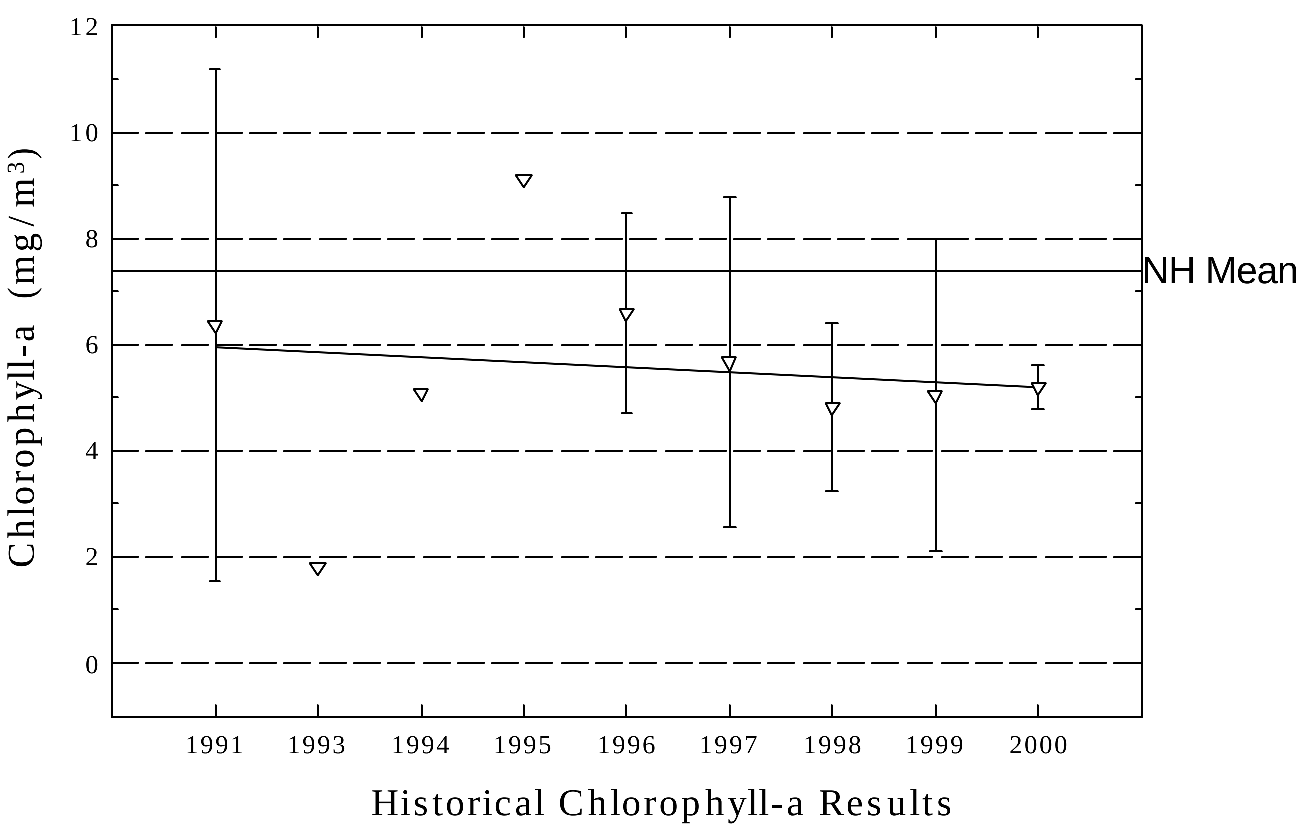
Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Bearcamp Pond

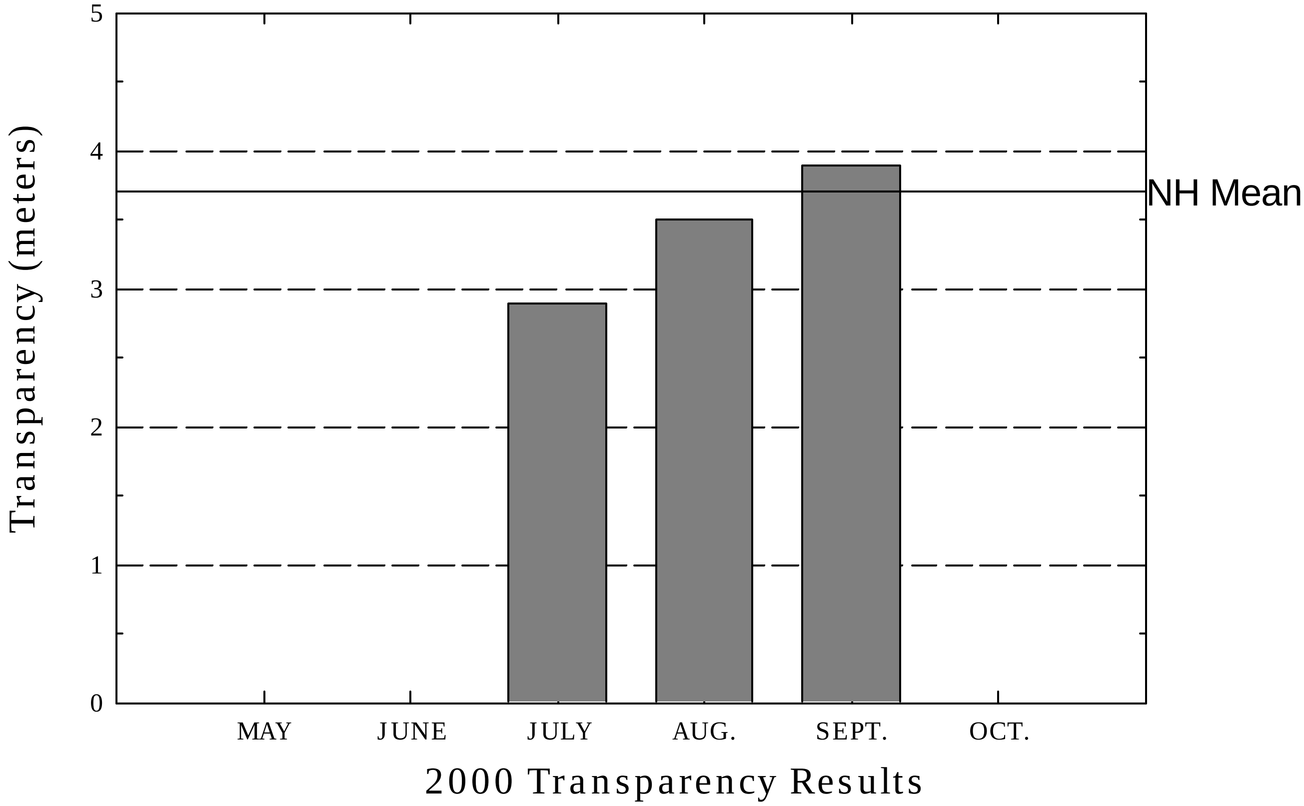
Figure 1. Monthly and Historical Chlorophyll-a Results

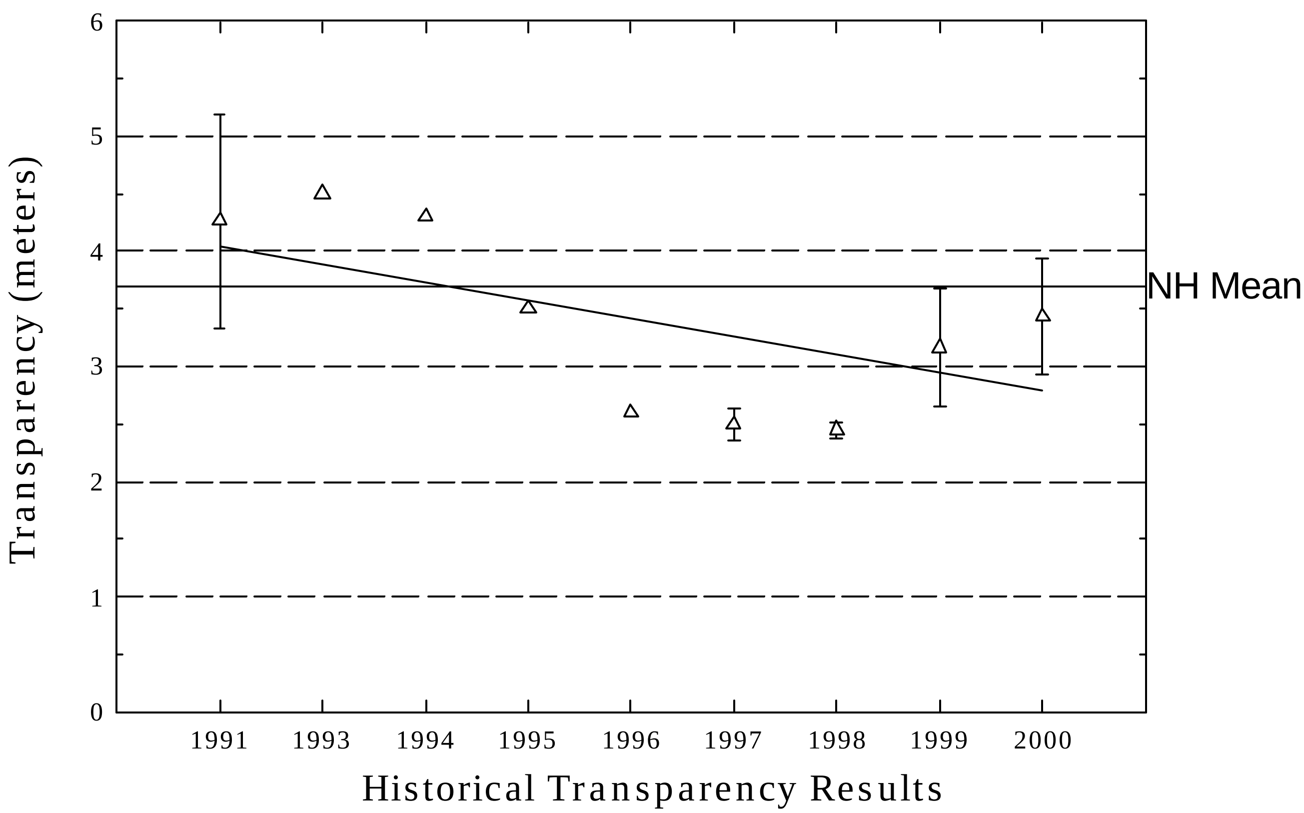




Bearcamp Pond

Figure 2. Monthly and Historical Transparency Results





Bearcamp Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

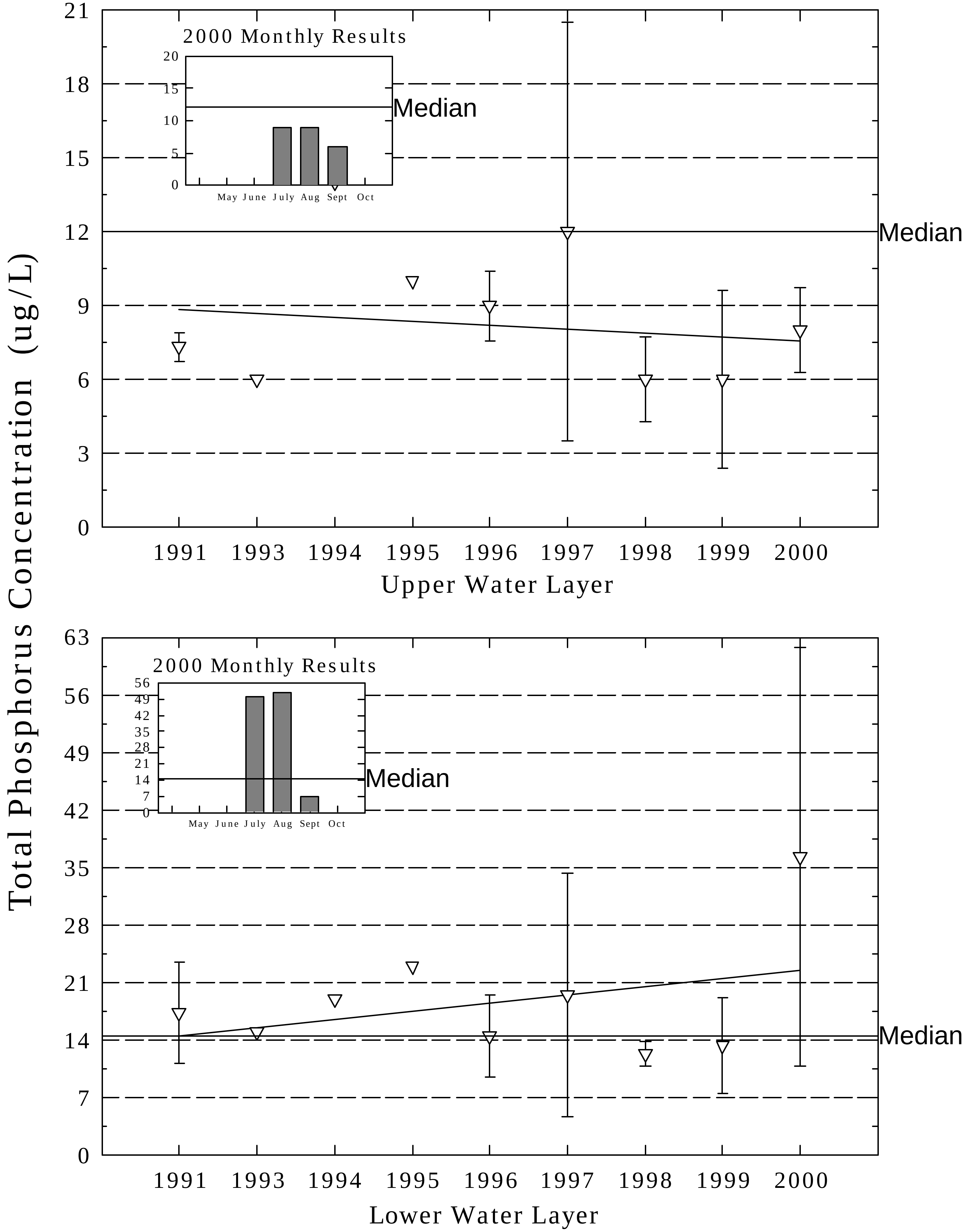


Table 1.

BEARCAMP POND

SANDWICH

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1991	1.09	10.57	6.36
1993	1.80	1.80	1.80
1994	5.09	5.09	5.09
1995	9.12	9.12	9.12
1996	5.27	7.92	6.59
1997	3.46	7.87	5.66
1998	3.27	6.42	5.07
1999	1.87	7.68	5.05
2000	4.95	5.67	5.19

Table 2.

BEARCAMP POND

SANDWICH

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06 / 27 / 1991	CHRYSOSPHAERELLA	50
	DINOBRYON	20
	ASTERIONELLA	13
08 / 05 / 1993	TABELLARIA	32
	ASTERIONELLA	24
	RHIZOSOLENIA	19
08 / 10 / 1994	SYNURA	77
	DINOBRYON	14
08 / 04 / 1995	CHRYSOSPHAERELLA	56
	SYNURA	24
	DINOBRYON	13
07 / 30 / 1996	DINOBRYON	69
	RHIZOSOLENIA	23
	ASTERIONELLA	4
07 / 31 / 1997	DINOBRYON	42
	CHRYSOSPHAERELLA	32
	GYMNODINIUM	5
07 / 06 / 1998	SYNURA	39
	CHRYSOPHAERELLA	34
	DINOBRYON	10
08 / 06 / 1998	SYNURA	27
	DINOBRYON	23
	TABELLARIA	23
07 / 02 / 1999	CHRYSOSPHAERELLA	24
	RHIZOSOLENIA	24
	ASTERIONELLA	18
07 / 07 / 2000	SYNURA	37
	DINOBRYON	30
	RHIZOSOLENIA	17

Table 3.

BEARCAMP POND

SANDWICH

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1991	3.2	4.9	4.2
1993	4.5	4.5	4.5
1994	4.3	4.3	4.3
1995	3.5	3.5	3.5
1996	2.6	2.6	2.6
1997	2.4	2.6	2.5
1998	2.4	2.5	2.4
1999	2.6	3.6	3.1
2000	2.9	3.9	3.4

Table 4.

BEARCAMP POND
SANDWICH

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	6.35	6.83	6.56
	1993	6.70	6.70	6.70
	1994	6.65	6.65	6.65
	1995	6.56	6.56	6.56
	1996	5.71	6.70	5.97
	1997	6.25	6.41	6.32
	1998	6.27	6.64	6.42
	1999	5.97	6.69	6.27
	2000	4.09	6.93	4.57
HYPOLIMNION				
	1991	5.78	5.98	5.87
	1993	5.69	5.69	5.69
	1994	6.23	6.23	6.23
	1995	6.16	6.16	6.16
	1996	5.64	5.67	5.65
	1997	5.92	6.06	5.98
	1998	5.67	6.09	5.78
	1999	6.00	6.13	6.07
	2000	5.75	6.57	5.99
INLET				
	1991	6.11	6.55	6.32
	1993	5.97	5.97	5.97
	1994	6.51	6.51	6.51
	1995	6.45	6.45	6.45
	1996	6.11	6.32	6.20

Table 4.

BEARCAMP POND
SANDWICH

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1997	5.98	6.38	6.14
	1998	6.10	6.34	6.20
	1999	5.89	6.32	6.08
	2000	6.10	6.38	6.25
METALIMNION				
	1991	5.90	6.67	6.20
	1993	5.85	5.85	5.85
	1994	6.02	6.02	6.02
	1995	5.96	5.96	5.96
	1996	5.61	5.65	5.63
	1997	5.75	5.79	5.77
	1998	5.52	5.85	5.61
	1999	5.90	6.68	6.13
	2000	5.88	6.11	6.01
OUTLET				
	1991	6.04	6.61	6.32
	1993	6.62	6.62	6.62
	1994	6.75	6.75	6.75
	1995	6.55	6.55	6.55
	1996	6.40	6.40	6.40
	1997	6.36	6.36	6.36
	1998	6.23	6.49	6.35
	1999	6.14	6.53	6.35
	2000	6.44	6.64	6.56

Table 4.

BEARCAMP POND
SANDWICH

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
PREINLET				
	1996	6.65	6.65	6.65
	1997	6.68	6.78	6.73
	1998	6.47	6.91	6.67
	1999	6.11	6.76	6.38
	2000	6.60	6.90	6.74

Table 5.

BEARCAMP POND

SANDWICH

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1991	3.20	3.70	3.47
1993	3.70	3.70	3.70
1994	3.90	3.90	3.90
1995	3.60	3.60	3.60
1996	3.80	4.40	4.10
1997	3.40	3.50	3.45
1998	3.10	4.00	3.68
1999	3.60	4.90	4.13
2000	-3.90	4.80	1.50

Table 6.

BEARCAMP POND
SANDWICH

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	22.2	25.8	23.5
	1993	23.3	23.3	23.3
	1994	25.0	25.0	25.0
	1995	24.5	24.5	24.5
	1996	22.9	24.8	23.8
	1997	20.4	21.5	20.9
	1998	18.7	21.2	19.7
	1999	23.0	24.5	23.6
	2000	22.9	58.7	35.0
HYPOLIMNION				
	1991	22.0	30.3	25.3
	1993	24.2	24.2	24.2
	1994	33.1	33.1	33.1
	1995	38.3	38.3	38.3
	1996	25.3	27.9	26.6
	1997	23.6	29.6	26.6
	1998	20.5	30.1	25.2
	1999	23.0	35.5	27.9
	2000	22.9	25.0	23.8
INLET				
	1991	28.0	30.5	28.8
	1993	32.1	32.1	32.1
	1994	30.8	30.8	30.8
	1995	32.4	32.4	32.4
	1996	25.5	26.8	26.1

Table 6.

BEARCAMP POND
SANDWICH

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1997	24.6	25.0	24.8
	1998	19.2	29.2	24.9
	1999	24.3	31.2	28.3
	2000	28.7	31.7	30.0
METALIMNION				
	1991	21.6	27.9	23.8
	1993	25.4	25.4	25.4
	1994	27.1	27.1	27.1
	1995	27.8	27.8	27.8
	1996	24.3	28.3	26.3
	1997	21.3	21.7	21.5
	1998	17.7	22.0	19.8
	1999	23.1	24.3	23.6
	2000	22.9	24.3	23.7
OUTLET				
	1991	22.5	25.5	23.5
	1993	22.8	22.8	22.8
	1994	24.3	24.3	24.3
	1995	25.4	25.4	25.4
	1996	23.0	24.7	23.8
	1997	19.9	20.4	20.1
	1998	18.6	21.4	19.9
	1999	23.3	23.6	23.4
	2000	22.6	23.3	23.0

Table 6.

BEARCAMP POND

SANDWICH

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
PREINLET				
	1996	31.5	31.5	31.5
	1997	24.2	25.1	24.6
	1998	19.4	29.8	25.8
	1999	23.6	31.6	28.2
	2000	29.5	31.7	30.3

Table 8.

BEARCAMP POND
SANDWICH

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1991	7	8	7
	1993	6	6	6
	1994	14	14	14
	1995	10	10	10
	1996	8	10	9
	1997	6	18	12
	1998	4	10	7
	1999	3	10	6
	2000	6	9	8
HYPOLIMNION				
	1991	12	24	17
	1993	15	15	15
	1994	19	19	19
	1995	23	23	23
	1996	11	18	14
	1997	9	30	19
	1998	11	14	12
	1999	10	20	13
	2000	7	52	36
INLET				
	1991	12	15	13
	1993	12	12	12
	1994	11	11	11
	1995	14	14	14
	1996	13	18	15

Table 8.

BEARCAMP POND

SANDWICH

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1997	7	15	11
	1998	8	22	14
	1999	8	14	10
	2000	13	21	16
METALIMNION				
	1991	9	11	10
	1993	11	11	11
	1994	19	19	19
	1995	16	16	16
	1996	9	14	11
	1997	8	11	9
	1998	8	46	21
	1999	5	12	8
	2000	7	11	8
OUTLET				
	1991	5	7	6
	1993	5	5	5
	1994	5	5	5
	1995	8	8	8
	1996	8	9	8
	1997	6	32	19
	1998	5	9	7
	1999	4	10	6
	2000	5	7	6

Table 8.

BEARCAMP POND

SANDWICH

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
PREINLET				
	1996	10	10	10
	1997	6	32	19
	1998	5	12	9
	1999	9	16	11
	2000	8	16	12

Table 9.

BEARCAMP POND

SANDWICH

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 7, 2000			
0.1	23.7	7.5	88.7
1.0	23.1	7.5	87.8
2.0	23.0	7.5	87.7
3.0	22.8	7.2	84.0
4.0	18.0	6.5	68.3
5.0	15.0	3.2	31.7
6.0	12.0	3.1	28.9
7.0	10.0	3.3	29.3
8.0	9.2	2.8	24.1
9.0	8.9	2.2	19.0
9.5	8.0	2.0	17.0

Table 10.

BEARCAMP POND

SANDWICH

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 27, 1991	10.0	6.6	1.1	8.9
August 5, 1993	10.0	7.7	0.4	3.0
August 5, 1993	10.0	7.7	0.4	3.0
August 10, 1994	10.0	9.0	0.2	2.0
August 4, 1995	10.0	10.0	0.2	2.0
July 30, 1996	9.5	10.2	0.3	3.0
July 31, 1997	10.0	10.6	0.3	3.0
July 6, 1998	10.0	8.3	0.1	0.0
July 2, 1999	9.5	9.7	7.5	66.1
July 7, 2000	9.5	8.0	2.0	17.0

Table 11.

BEARCAMP POND
SANDWICH

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.4	0.6	0.5
	1998	0.4	0.7	0.5
	1999	0.3	0.5	0.4
	2000	0.3	0.3	0.3
HYPOLIMNION				
	1997	1.7	2.1	1.9
	1998	2.0	3.3	2.6
	1999	0.8	2.4	1.5
	2000	0.4	5.8	2.6
INLET				
	1997	0.5	0.5	0.5
	1998	0.3	0.7	0.5
	1999	0.5	0.8	0.7
	2000	0.4	0.6	0.5
METALIMNION				
	1997	0.5	1.0	0.7
	1998	0.6	3.1	1.4
	1999	0.4	0.8	0.6
	2000	0.5	0.9	0.7
OUTLET				
	1997	0.2	0.5	0.4
	1998	0.3	0.3	0.3
	1999	0.1	0.6	0.4
	2000	0.2	0.2	0.2
PREINLET				

Table 11.

BEARCAMP POND

SANDWICH

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1997	0.3	0.4	0.3
	1998	0.3	0.4	0.3
	1999	0.4	1.0	0.7
	2000	0.3	0.5	0.4